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THE VALIDITY OF ELEOCHARIS QUADRANGULATA.

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(Plate 149.)

In revising the treatment of *Eleocharis* for the 7th edition of Gray's Manual it was not found satisfactory to follow Dr. Britton in reducing to the tropical American *E. mutata* (L.) R. & S.[1] the plant of temperate eastern North America which was described by Michaux as *Scirpus quadrangulatus*[2] and which under Eleocharis becomes *E. quadrangulata* (Michx.) R. & S.[3] Subsequently, however, the latter plant has continued to be treated by Dr. Britton and by those who have not checked his identification, as strictly identical with the tropical *E. mutata* and the present writer has frequently been called upon to explain this discrepancy in the treatment of *E. quadrangulata*. The question coming anew, it seems desirable to point out the characters of the three species which are often confused under the blanket-name *E. mutata*.

The first of these plants published was *Scirpus mutatus*, described in Elmgren's dissertation under Linnaeus, *Pugillus Jamaicensium Plantarum*.[4] The original description was brief:

SCIRPUS *mutatus;* admodum similis *Scirpo articulato,*
sed differt culmo triquetro, minime articulato;

but in the 2d edition of the *Species Plantarum* Linnaeus made it clear that *S. mutatus* has the culms not "less articulated" but "not articulated:"

[1] R. & S. Syst. ii. 155 (1817).
[2] Michx. Fl. Bor. Am. i. 30 (1803).
[3] R. & S. l. c. (1817).
[4] L. Amoen. Acad. v. 391 (1760).

Simillimus S. geniculato, sed Culmus triqueter, molliusculus, nec articulatus.[1]

The plant of temperate eastern North America was clearly described under *Scirpus* by Michaux.

QUADRANGULATUS. S. aphyllus; culmis stricte erectis, acute quadrangulatis: spica longo-cylindrica; squamis rotundato-obtusis.

Obs. Affinis *S. mutato.*

Hab. in Carolina.[2]

In the *Illustrated Flora,* Dr. Britton[3] reduced *E. quadrangulata* without reservation to *E. mutata,* although in the description he overlooked the 3-angled culms of the latter species and ascribed to *E. mutata* (incorrectly) "culms sharply 4-angled"; and he also ascribed to *E. mutata* a "conic acute tubercle, which is truncate or contracted at the base," the characteristic tubercle of the northern *E. quadrangulata* but by no means of the tropical plant with 3-angled culms generally passing as *E. mutata;* and the artist correctly figured the 4-angled culms and the outline of the characteristic achene and tubercle of the northern plant. In the 2nd edition of the *Illustrated Flora,* however, the correct illustration of *E. quadrangulata* was retained, the description (as *E. mutata*) was recast to include some characters of the tropical plant: "culms sharply 3–4-angled," and the achene capped merely by "the conic acute tubercle,"[4] with nothing said, as in the 1st edition, about its being contracted at base. Similarly, in the *Botany of Porto Rico and the Virgin Islands,*[5] Dr. Britton, although not definitely citing *E. quadrangulata* as a synonym, gives *E. mutata* a range including "eastern United States" and culms "3–4-angled."

When the achenes of the temperate American plant with 4-angled culms, *E. quadrangulata,* are examined they are found to have a clearly defined neck below the elongate tubercle (figs. 1–4); when the achenes of the tropical American plant which seems to be *E. mutata*[6] (a plant with 3-angled culms) are examined they show a thick collar, rather

[1] L. Sp. Pl. ed. 2, i. 71 (1762).

[2] Michx. l. c. (1803).

[3] Britton in Britton & Brown, Ill. Fl. i. 249, fig. 578 (1896).

[4] Britton l. c. ed. 2, i. 311 (1913).

[5] Britton, Sci. Surv. Porto Rico and Virgin Ids. v. pt. i. 90 (1923).

[6] Such Jamaican material as is at hand agrees with the descriptions of Grisebach and of Clarke in having the achene smooth or very finely and delicately cancellate; accordingly this tropical American plant with most delicately cancellate achene is here understood as *E. mutata.*

than a slender and collarless neck projecting about the base of the style (figs. 12–14). Furthermore, in *E. mutata* the mature achene (including the tubercle) is only 1.7–2.3 mm. long, the achene of *E. quadrangulata* measuring (with the tubercle) 2.7–4.2 mm. long. The characteristic differences in the achenes of *E. mutata* (figs. 12–14) and *E. quadrangulata* (figs. 1–4) are brought out in the drawings which Dr. Arthur M. Johnson has most kindly made from specimens selected from a wide geographic range: fig. 1 from Missouri, 2 from New Jersey, 3 from central New York, 4 from eastern Massachusetts; 12 from the island of St. Jan (Danish West Indies), 13 from Venezuela, 14 from French Guiana. *E. mutata* occurs on various West Indian islands (seen from Jamaica, St. Jan and Guadeloupe), in Venezuela, British Guiana, French Guiana, Brazil, Colombia and Panama. It has been reported from Albemarle Island in the Galapagos group but the achene of the Albemarle plant (fig. 11) is not characteristic, having a more definite neck than in the other plants and further collections may show it to be worthy separation. *E. quadrangulata* occurs from eastern Massachusetts to southern Ontario, south to Georgia, Louisiana and eastern Texas.

The third species which is generally passing in tropical America as *Eleocharis mutata* has, like that species, a 3-angled culm but its pale-green to olive-green achenes are globose-obovoid and more coarsely sculptured than are the olive to brown achenes of *E. mutata* and there is a distinct constriction below the tubercle, somewhat as in the northern *E. quadrangulata*. In *E. mutata* (figs. 12–14) the longitudinal ribs of the achene are about 50 in number, rather crowded and in mature fruit often inconspicuous; in *E. quadrangulata* the larger and in maturity castaneous achenes are similarly marked; but in the tropical American plant with 3-angled culms and pale-green to olive-green globose-obovoid achenes with constricted neck (figs. 5–10) there are only 20–30 remote longitudinal ribs conspicuous at maturity and connected by rather distinct cross-ridges. And this plant has achenes intermediate in size between those of *E. mutata* (figs. 12–14) and of *E. quadrangulata* (figs. 1–4). In the former, as already stated, they are 1.7–2.3 mm. long; in the latter 2.7–4.2 mm. long; while in the third species (figs. 5–10) they measure 2–2.8 mm. in length. In its technical characters this third species is a close match for oriental specimens of *E. fistulosa* (Poir.) Schultes.[1] Specimens

[1] Schultes, Mant. ii. 89 (1824).

of the latter in mature fruit from India, China and Ceylon (fig. 6), from Sierra Leone (fig. 5) and from central Africa are in habit quite identical with and show achenes essentially inseparable from those of plants of Cuba (fig. 7), Colombia, Paraguay, Panama (fig. 10) and Vera Cruz (fig. 9) and from Chatham Island in the Galapagos (fig. 8).

In fact, in 1869 Boeckeler recognized this identity of the tropical American with the oriental plant, accurately describing *E. fistulosa* (as *Heleocharis*) and citing[1] specimens not only from India, Ceylon and Madagascar but from Jalapa (Vera Cruz), Brazil, British Guyana and the West Indian island of Guadeloupe. Caruel, likewise, recognized it as an American plant when he reported[2] it from Chatham Island in the Galapagos, and Stewart[3] also reported it from Chatham Island. Stewart's specimens in mature fruit are quite typical (fig. 8). Nevertheless, the late C. B. Clarke wholly ignored or discredited the occurrence of *E. fistulosa* in tropical America, treating[4] the American plants and references as all belonging to *E. mutata*. That *E. mutata*, *E. fistulosa* and *E. quadrangulata* are abundantly distinct should be obvious from Dr. Johnson's drawings of the achenes of the three species.

Gray Herbarium.

Explanation of Plate 149.

Figs. 1–4, achenes of *Eleocharis quadrangulata*, × 10; 1 from Newton Co., Missouri (*Bush*); 2 from Sussex Co., New Jersey (*Porter*); 3 from Cayuga Co., New York (*Eames, Randolph & Wiegand*, no. 11,410); 4 from Norfolk Co., Massachusetts (*Fernald & Wiegand*, no. 133). Figs. 5–10, achenes of *E. fistulosa* × 10; 5 from Sierra Leone (*Scott Elliot*, no. 4453); 6 from Ceylon (*Thwaites*, no. 3162); 7 from Cuba (*Wright*, no. 3376); 8 from Chatham Island (*Stewart*, no. 1080); 9 from Vera Cruz (*Botteri*, no. 756); 10 from Panama (*Pittier*, no. 4557). Figs. 11–14, achenes of *E. mutata* × 10; 11 doubtful plant from Albemarle Island, Galapagos (*Snodgrass & Heller*, no. 261); 12 from St. Jan, Danish West Indies (*Eggers*); 13 from Venezuela (*Broadway*, no. 580); 14 from French Guiana (*Broadway*, no. 203).

[1] Boeckeler, Linnaea, xxxvi. 472 (1869–70).
[2] Caruel, Rendic. della R. Accad. dei Linc. v. 622 (1889).
[3] A. Stewart, Proc. Cal. Acad. Ser. 4, i. 43 (1911).
[4] C. B. Clarke in Urban, Symbolae Antillanae, ii. 61 (1900).